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DISCUSSION.

THE PSYCHOLOGY OF 'THE GRAMMAR OF SCIENCE.'

SOME five years ago Professor Karl Pearson published a work entitled *The Grammar of Science*, intended, so he tells us, "as a criticism of the fundamental concepts of modern science." He believed that science, and especially physics, suffered seriously from the incorrect statement of these 'fundamental concepts.' Science, he says, has not yet entirely withdrawn from the shadow of metaphysics and superstition. It is his aim and desire, therefore, so to set forth in *The Grammar* the ground principles of science that its method and scope may be determined on an independent basis. His plan is to give a critique of scientific method.

When *The Grammar of Science* first appeared it was criticised from various points of view. Its restatement in unique form of the time-honored conceptions and postulates of science caught the attention of the physicist and the biologist; while its assertion that science furnishes the only valid method and sphere for knowledge, attracted at least the notice of many who incline to the belief that modesty in pretension is a virtue even in so powerful a claimant as science. The criticism was also made (as, for example, by Professor Lloyd Morgan [1]) that in *The Grammar* the objective standpoint was unwisely forsaken for a subjective; that science, instead of assuming the position of Naïve Realism, was here asked to consider external phenomena as mental states, beyond which knowledge cannot go. For the 'facts' of science, the author maintains, are not given in the external world, as is generally supposed, but in the human mind. Science, he is persuaded, must limit its data to 'sense-impressions.' [2] It must study mental contents alone, if it would escape the futility of things-in-themselves and the mysticism of supersensuous seemings. Such an interpretation of the 'facts' of science obviously resolves all science into psychology. We find, in fact, that the author gives as the basis of his theory of science an outline of psychology. We are compelled, therefore, to ask (1) whether Professor Pearson assigns to psychology its proper place among the sciences, and (2) whether psychology, as interpreted by him, is competent to furnish a basis for the structure of knowledge which he would rest upon it.

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[1] *Natural Science*, June, 1892.

[2] *Op. cit.*, pp. 29, 135, 330, 395, 442.

In the first place, it is necessary to distinguish carefully the true relation of a theory of knowledge to psychology and the other sciences. A theory of knowledge takes account of all the factors implied in knowledge, — both the 'objective' and the 'subjective,' — and tries to state how we know, as well as to define the limits of our possible knowledge. What are called the 'natural' sciences and psychology are both partial abstractions, though both deal with reality. The former abstract from that which belongs to consciousness *as* consciousness, and seek to arrange and unify things and processes of the 'external' world. To this end various principles of explanation are postulated. Psychology, on the other hand, abstracts from the meaning which mental states have for the natural sciences; treats them as mental processes; determines their relations to each other and to certain bodily states; and investigates the laws governing their appearance in consciousness.[1] Thus, while psychology and the other sciences deal with the same experience, each has its own point of view and works by its own definite method towards its own end.

It is the disregard, I take it, of this distinction within the sciences which leads to the evident confusion in the work before us. If one sets out to write a theory of knowledge (and Professor Pearson's task resolves itself into that), it is necessary to discuss the known *as known*, as well as the knower; not the knower to the exclusion of the known. When, therefore, we are told that the field of knowledge never takes us beyond the central nerve terminals, that "the mind is absolutely confined within its nerve exchange; beyond the walls of sense-impression it can logically infer nothing,"[2] we feel obliged to exclaim:

> "Weh, Weh, du hast sie zerstört, die schöne Welt!"

The author's position is made more explicit by his comparison of the brain to a central telephone station.[3] The mind is 'seated' at the terminal ends of the nerve connections. Sensations come from the great unknown and unknowable. The 'mind' makes the proper connections between sensations, past and present, by 'shunting' its wires (brain tracts). This shunting is known to the subject as consciousness. If reaction to a stimulus occurs forthwith, there is no consciousness. The 'exertion' of connecting 'sense-impressions' with 'stored impresses' is what yields thought.[1] But the telephone figure involves serious difficulties. First, it makes the mind something apart from its concrete states. (To this I shall have occasion later to refer.) Secondly, it gives a 'seat to the soul' in space. It is asserted, on the one hand, that space is inhabited by unknowable *Dinge-an-sich* that are always sending in messages (sensations), which can never be traced back to their authors. Later, space is seen to be phenomenal. That is to say, the mind is first in space, and then space in it!

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[1] Even in the border-land of psychophysics it is the *mental* that is investigated, reference to the 'external' world being made for the purpose of cataloguing the conditions under which psychoses occur, and also for finding convenient means to register in physical terms the various characteristics of mental states.

[2] *Op. cit.*, p. 130.

[3] *Op. cit.*, pp. 53 ff.

It will not be difficult now to understand the author's definition of an 'external object.' "An external object," he says, "is in general a construct; that is, a combination of immediate with past or stored sense-impressions. The reality of a thing depends upon the possibility of its occurring as a group of immediate sense-impressions."[2] Here we see the overstatement of an important, if self-evident, truth; namely, the dependence of the world of phenomena as we know it upon the perceiving mind. This, however, is a *partial* truth if we neglect to add that knowledge is knowledge of *something;* that it is knowledge of an external, ordered world of objects as real as the percipient subject. In short, that the *real* is given *to* the mind, and not alone *by* the mind.[3] With this criticism upon the general standpoint of the book, I pass to an examination of the author's 'mind,' which is to furnish the data and the method for science.

Even a casual survey of the chapter on "The Facts of Science" reveals the writer's philosophical lineage. His psychology is the psychology of the English School of Experience. The mind is a collection of atomic units held together by the cohesion known as 'association.' It is the psychology brought down from Hume and modified by Mill, Spencer, and others. The parallelism between

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[1] This is essentially Spencer's view of consciousness as mental states built up by joining 'vivid' and 'faint' feelings. Cf. *Prin. of Psy.*, vol. i, pp. 181, 182.

[2] *Op. cit.*, p. 50.

[3] Since the above was written an article has appeared in *Mind* (April, 1897), "On the Nature of the Notion of Externality," which discusses from an epistemological point of view the inadequacy of Professor Pearson's use of perception as a mere succession of mental states whose flow is a subjective routine from which experience is derived.

Hume and the author of *The Grammar* may be shown briefly in outline. The materials of consciousness, says Hume, are impressions (which include sensations, passions, and emotions) and ideas. All impressions are finally derived from sensations. Sensation is the underived element. It "arises in the soul originally from unknown causes." Passions and emotions are derived from it by 'reflection.' Ideas are faint copies of impressions. Whatever is found in the mind is derivable from impressions and ideas, and these, finally, from sensation.[1] The author of *The Grammar* similarly starts his mind with 'perceptions' and 'reflections.' The contents of perception are immediate and stored sense-impressions. The last-named are Hume's 'ideas.' Everything which is neither sense-impression nor a group of impressions is 'metaphysical,' and therefore to be rejected as unreal.[2] By reflection the mind reaches conceptions. This activity furnishes the laws of science. Reflection involves association. "The work of science viewed from the psychological standpoint," we read, "is thus essentially that of association, and from the physical standpoint the development of the various excitatory connections between the several portions of the cortex or the centres of brain activity. We have immediate sense-impressions; these are in part retained as stored sense-impresses, and are capable of being revived by kindred immediate sense-impressions. From the stored sense-impresses we form, by association, conceptions which may or may not be real limits to perceptual processes. These conceptions are in the latter case only ideal symbols, conceptual shorthand, by aid of which we index or classify immediate sense-impressions, stored impresses, or other concepts themselves. This is the process of scientific thought which probably has for its physical aspect the development or establishment of what the physiologist would term 'commissural' links between the physical centres of thought."[3] "Science deals with the mental, the 'inside' world, and the aim of its processes of classification and inference is precisely that of instinctive or mechanical association, etc."[4]

Plainly, the great fallacy of the kind of associational psychology for which *The Grammar* stands, is its refusal to treat consciousness as a process. In the 'process' view there are no stable, unchanging 'things' which, as ideas, image external objects. The conscious 'stream' is in constant flux, in a continual state of becoming. Beyond or behind the operations themselves the 'process-psychology' assumes no mysterious entity to which these refer. If, on the contrary, sensations and their copies are treated as self-contained wholes there must be something posited to hold them together. As we saw under the telephone figure, *the mind*, the conscious Ego,[1] connects sense impressions, past and present. It follows that the mind is something outside the mental states themselves. The union of isolated parts, we are asked to believe, is effected by the subtle power of 'association.'

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[1] Cf. *Treatise of Human Nature*, bk. i, pt. i, §§ 1, 2.

[2] Cf. Hume's query: "Is the idea of substance derived from the impressions of sensation or reflexion?" *Op. cit.* (Selby-Bigge ed.), p. 15.

[3] *Op. cit.*, pp. 441–2.

[4] *Op. cit.*, p. 81.

This principle of association, with which Hume[2] dealt vaguely and unclearly, has been variously conceived by subsequent English writers. Hume is not sure whether the relating of impressions is due to attributes of the impressions themselves or to some other force acting upon them. He speaks of association as a 'gentle force' of the mind.[3] Huxley criticises this view and demands a *tertium quid* as mediator between sensations, an ultimate element of mind which he calls 'an impression of relation.'[4] In inserting relation as the *nervus* of association Huxley follows Spencer, who lays a further burden on the association concept by making it cover a process of assimilation of every 'feeling' (sensation) and emotion with all previous ones alike in kind. That is, he equates the 'local mark' of a sensation, as well as the feeling of knownness attaching to a perception, with a process of association. The content usually given to the term 'association' is reserved by Spencer for connections between 'relations.' Wherever unlike contents are joined, the bond is between 'feelings of relation' which accompany the feelings of contents. The former being connected, the contents of the adjoined terms are connected.[5] The association doctrine as formulated by Hartley and Jas. Mill further extends the principle to all mental processes, cognitive, affective, and volitional. While Professor Pearson's theory of association is not elaborated, it is essentially the same in outline as Spencer's. The main point to be emphasized is that thinking consists in associating 'impressions,' past and present, and that this is represented on the physical side by the excitation of nerve cells and fibres corresponding respectively to sensations and relations between sensations.[1]

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[1] "Very much in the position of such a telephonic clerk is the conscious *Ego* of each one of us seated at the brain terminals of the sensory nerves." *Op. cit.*, p. 74.

[2] *Op. cit.*, bk. i, pt. i, *passim*.

[3] *Loc. cit.*, § 4.

[4] *Hume*, p. 66.

[5] *Prin. of Psychology*, vol. i, pt. ii, chs. vii, viii.

The ground of the fallacy which we have found in the theory of association just sketched may, I think, be shown in a few words. It is due to a confusion between psychology and logic. Sensational atomism has been propped up by the addition of logical abstractions which have passed for real psychological elements. Pure atomism could give no account of the unity of consciousness, and called to its aid 'sensations of relation' to give continuity and coherence to mental phenomena. These 'sensations of relation' have been got by analysis of the significance, the meaning, the logical relations of thought, instead of by analysis of consciousness as a procession of changing states. 'Idea' and 'perception' have been used ambiguously as logical and as psychological concepts. When perceptions and their 'relations' are divided by hard and fast lines and their connections represented, not only schematically, but actually, by brain vesicles (which correspond to the simple sensations) and brain fibres (whose excitation gives the 'feeling' of relation between sensations), the absurdity of setting up logical abstractions to represent mental processes becomes baldly apparent. Here, it seems to me, a position like Professor Pearson's is open to severe criticism. The old fallacy appears in all its viciousness when the whole fabric of scientific knowledge is made to rest upon it.

It may be said that, if psychology rejects the Humian view of mind as something which fuses and orders the uncohesive elements of consciousness, it is obliged to introduce a no less objectionable factor, as, for example, a transcendental Ego, to effect a unity of experience. This, it will be urged, does not escape the stigma of a 'substantial soul' by its more indefinite and high-sounding title. In answer, I should say that it is not the business of psychology to find a metaphysical entity which shall explain experience. It must not seek a 'thing' *among* mental states to account for the connection of the latter. As Kant pointed out, psychology deals with the empirical self, "the succession of mental states, — the thoughts, feelings, and actions, — upon which a man may look back as constituting the record of his experience. The empirical self is thus an object among objects; it is part of the process of experience."[1] Psychology recognizes that the *whole* of the process — from which it abstracts a *part*—is experience. "The ultimate fact of knowledge is neither pure subject nor pure object, — neither a mere sensation nor a mere Ego, but an Ego or subject conscious of sensations. It is not a mere unity, but a unity in duality."[2] Mind, for psychology, is a "substance in which qualities inhere," in quite the same way that the physical sciences conceive substance. It is not something different and apart from mental states, but it is these as presented continuously to the individual; the presentation of the "identical self," — "the permanent which suffers change." Psychology speaks with as good right of *mind* as physics does of *matter*. Neither has a right to hamper its procedure by rejecting working conceptions, because these cannot be ultimately hypostatized by a consistent ontological system.

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[1] The author says (pp. 62, 63): "The contents of the mind at any instant are very far from being identical with the range of actual or possible sense-impressions at that instant. We are perpetually drawing inferences as to things which lie beyond immediate verification by sense. . . . Science is largely based upon inferences of this kind . . . and the scientific method consists in drawing just comparisons and inferences from stored sense-impresses and the conceptions based upon them." This passage may seem to invalidate what we have said concerning the author's conception of the thought process. His own statement, however, quoted above (pp. 8, 9), confirms our assertion that for him thought is adequately explained in terms of the old formula of association.

Apropos of Professor Pearson's insistence on his associational formula as an irresistible alchemic reagent for transforming 'sense-impression' into knowledge, we may observe that he calls the mind a "great sorting machine,"[3] into which inchoate and amorphous sensations are tumbled pellmell, and from which they emerge as ordered science. While thus admitting, in words, a subjective, combining element in experience, he misses the true significance of such an element by substituting for a creating, synthetic power of the mind a mere function of arranging and relating the bare products of the senses. By thus trying to bestride the chasm between Idealism and Realism, he falls into the cleft between them, and narrows his mental horizon to a mere strip, which he is pleased to call 'science.'[4]

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[1] Andrew Seth, *Hegelianism and Personality*, p. 14.

[2] *Ibid.*, p. 13.

[3] *Op. cit.*, p. 128.

[4] The author's claim that the scientific frame of mind is the one prime requisite for the 'ideal citizen' (see his Introduction) suggests the inadequacy of treating mind as a colorless series of cognitions. The *mere knower* is as much a fiction in science as elsewhere, and, if actualized, would be worthless, even in classifying 'facts.' As Professor James says in *The Will to Believe*, "If you want an absolute duffer in an investigation you must, after all, take the man who has no interest whatever in his results." A division of consciousness into water-tight compartments of 'knowing,' 'feeling,' and 'willing' is certain to produce mental monstrosities.

My criticism of *The Grammar of Science*, therefore, is (1) that it confuses epistemology with psychology, and (2) that the psychology it adopts is a superannuated system, wholly incapable of supporting the burden that science, according to Professor Pearson's interpretation, imposes upon it.

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